What Works Clearinghouse

ies INSTITUTE OF EDUCATION SCIENCES

I CAN Learn® Pre-Algebra and Algebra

Program description

The *I CAN Learn® Pre-Algebra* and *Algebra* computerized curricula are designed to cover mathematics and problem-solving skills for ethnically diverse, inner-city students in grades 6–12. The curricula are designed to equip students with the skills they need to meet district, state, and national math objectives through an interactive software program that teaches pre-algebra and algebra. The *I CAN Learn® Pre-Algebra* software program consists of 131 lessons, and *Algebra* of 181 lessons. The developer describes the curriculum software as meeting National Council of Teachers of Mathematics standards and configurable to meet state and local grade-level expectations.

Research

One study of *I CAN Learn® Pre-Algebra* and *Algebra* met the What Works Clearinghouse (WWC) evidence standards and five more studies met WWC evidence standards with reservations. The six studies, which included more than 16,600 eighth- and ninth-grade students in middle and high schools in California, Florida, Georgia, and Louisiana, compared the standardized math performance of students who used the *I CAN Learn®* system with that of students who used traditional curricula.[1]

Effectiveness

The *I CAN Learn® Pre-Algebra* and *Algebra* curricula were found to have positive effects on math achievement.

	Math achievement
Rating of effectiveness	Positive effects
Improvement index[2]	Average: +6 percentile points Range: –7 to +20 percentile points

1. The evidence presented in this report is based on the available research. Findings and conclusions may change as new research becomes available.
2. These numbers show the average and range of improvement indices for all findings across the studies.

Additional program information

Updating previous report

This report updates the previous WWC report on *I CAN Learn*® that was released on the WWC website in November 2004. Since the release of the previous report, the WWC has updated its evidence standards and developed peer-review procedures for adjusting such methodological flaws in studies as mismatch between the unit of assignment and the unit of analysis and lack of adjustment for multiple comparisons. These standards and procedures, when applicable, have been applied to studies included the original *I CAN Learn*® *Pre-Algebra* and *Algebra* review. Six new studies were identified for this updated report.

Developer and contact

JRL Enterprises, Inc. Address: 400 Poydras Street, Suite 1000, New Orleans, LA 70130. Web: www.icanlearn.com. Email: support@icanlearn.com. Telephone: (888) 263-1390.

Scope of use

The curriculum was first implemented in 1995. As of March 2006, the *I CAN Learn*® system was being used in 16 elementary schools, 101 middle schools, and 123 junior and senior high schools across the United States. The *I CAN Learn*® system is typically used in large urban school districts and smaller rural school districts where students are predominantly at-risk and members of ethnic minority groups.

Teaching

The pre-algebra and algebra lessons include instructional videos, interactive multimedia presentations, and a question bank. Both curricula were designed to connect math topics to "real world" applications. Lessons are grouped much like those in a textbook chapter. Students receive verbal and visual assistance in progressing through the lesson. After completing a lesson, students complete a cumulative review of the concepts taught, and teachers can monitor student progress through real-time assessment.

Although much of the instruction is individualized for students in the *I CAN Learn*® system, teachers are expected to help determine the content of the lesson and other aspects of the class. At the beginning of the year the teacher determines the homework assignments, lesson organization, lesson presentation, manipulatives, assessments, and grade evaluations. The program follows the teacher's lesson plan and provides constant feedback to both the student and the teacher. According to the developer, teachers can accommodate different learning styles in a classroom of up to 30 students using the *I CAN Learn*® system. The *I CAN Learn*® system also aims to facilitate classroom management, since teachers can use the Classroom Explorer tool to record attendance, homework, and test grades and to chart individual student progress.

As part of the *I CAN Learn*® system, teachers receive an initial two-day training in how to use the system. Teachers also have "best practices" training and unlimited access to training and on-site technical and pedagogical support in the classroom for three years. *I CAN Learn*® system personnel call or visit *I CAN Learn*® teachers weekly.

Cost

The cost of an *I CAN Learn*® classroom depends on its configuration and terms of support. A typical full installation—30 workstations in a classroom with all curriculum and classroom management software, computer hardware, network wiring, furniture, and three years of comprehensive onsite educational and technical support—costs $300,000, a one-time expense.

Research

In this updated review, 12 studies reviewed by the WWC investigated the effects of *I CAN Learn*® on students' math achievement. One study (Kirby, 2006 October) was a randomized controlled trial that met WWC evidence standards. Two studies (Kerstyn, 2001; Kerstyn, 2002 October) used a quasi-experimental design that met WWC standards with reservations. Three studies (Kirby 2004 September; Kirby, 2004a November; Kirby, 2005 January) were randomized controlled trials that met WWC

evidence standards with reservations because of teacher-intervention confounding problems. The remaining six studies did not meet WWC evidence screens.[3] Although each study investigated the effect of *I CAN Learn*® on a narrow population and setting, collectively the studies investigated and reported on middle school students of diverse racial and economic backgrounds in urban, suburban, and rural districts.

Met evidence standards

Kirby (2006, October) assessed the impact of the *I CAN Learn*® system on 2003–04 math achievement by randomly assigning students to intervention or comparison classrooms. The study included 2,400 eighth-grade regular education students from 13 Orleans Parish Public Schools. *I CAN Learn*® classrooms were compared with classrooms using a traditional curriculum.

Met evidence standards with reservations

Kerstyn (2001) used a classroom matched-pairs quasi-experimental design to investigate the effect of the first year of implementation of the *I CAN Learn*® system on math achievement of eighth-grade students in Hillsborough County Public Schools in Tampa, Florida. At the beginning of the 2000–01 school year, 58 *I CAN Learn*® classrooms (with 1,222 students) were matched with 58 traditional mathematics classrooms (with 1,314 students). The *I CAN Learn*® system was implemented with four separate samples of students enrolled in four math courses: Algebra 1 (8 classes, 175 students), Algebra 1 Honors (8 classes, 150 students), MJ-3 pre-algebra (32 classes, 678 students), and MJ-3 Advanced (10 classes, 219 students). The effectiveness of the *I CAN Learn*® system is reported for each of the four study samples in the Findings section.

Kerstyn (2002, October) continued the investigation of the *I CAN Learn*® system during the second year of implementation in Hillsboro County Public Schools with a quasi-experimental study of a different sample of 11,125 eighth-grade students in a total of 597 classrooms. The *I CAN Learn*® system was implemented with four separate samples of students enrolled in four math courses: Algebra 1 (10 classes, 188 students), Algebra 1 Honors (10 classes, 188 students), MJ-3 pre-algebra (64 classes, 1,028 students), and MJ-3 Advanced (37 classes, 424 students). The effectiveness of the *I CAN Learn*® system is reported for each of the four study samples in the Findings section.

Kirby (2004, September) assessed the impact of the *I CAN Learn*® system on 2003–04 math achievement by randomly assigning 204 eighth-grade students either to one teacher using the *I CAN Learn*® mathematics curriculum or two teachers using a traditional math curriculum in Bret Harte Middle School in Alameda County, California. The comparison classrooms used the state-adopted Glencoe pre-algebra textbook. Because there was only one *I CAN Learn*® teacher, it is not possible to separate the effect of the teacher from the effect of the *I CAN Learn*® system. Thus, even though students were randomly assigned, this study met WWC standards with reservations.

Kirby (2004a, November) randomly assigned 254 students either to *I CAN Learn*® classes or comparison classes. In the *I CAN Learn*® classes, one teacher facilitated instruction using the computerized curriculum. Students in the comparison classroom used a traditional math curriculum delivered by their teachers. Because there was only one *I CAN Learn*® teacher, it is not possible to separate the effect of the teacher from the effect of the *I CAN Learn*® system. Thus, even though students were randomly assigned, this study met WWC standards with reservations.

3. One study, Kirby (2004b, November), failed to meet evidence screens in the original review because of missing data for effect-size computations, but was reclassified as meets WWC standards in this updated report based on updated information (Kirby, 2006 October). A second study, Kirby (2004a, November), met WWC standards in the original review but met WWC standards with reservations in this updated review because only one teacher delivered the instruction using the *I CAN Learn*® system, and the WWC had reservations about the confounding of teacher characteristics with the intervention. A third study (Kirby, 2005 January) that met evidence standards with reservations was a new study added to this report.

Research *(continued)*

Kirby (2005, January) randomly assigned 137 ninth-grade students either to *I CAN Learn*® classrooms or traditional mathematics classrooms in a high school in Catoosa County, Georgia, in 2004. Because there was only one *I CAN Learn*® teacher, it is not possible to separate the effect of the teacher from the effect of the *I CAN Learn*® system. Thus, even though students were randomly assigned, this study met WWC standards with reservations.

Effectiveness

Findings

The WWC review of middle school math addresses student outcomes in the math achievement domain.

Kirby (2006, October) reported that the *I CAN Learn*® group statistically significantly outperformed the comparison group on the math exam from the Louisiana Educational Assessment Program test. The WWC confirmed this finding after correcting the statistical significance level for clustering.

Kerstyn (2001) reported positive but not statistically significant effects of *I CAN Learn*® classrooms over comparison classrooms for Algebra 1, Algebra 1 Honors, MJ-3 pre-algebra, and MJ-3 Advanced courses. The effect size for each of these samples was not large enough to be considered substantively important according to WWC criteria (at least 0.25).

Kerstyn (2002, October) reported, and the WWC analysis confirmed, a positive and statistically significant effect for *I CAN Learn*® students in MJ-3 pre-algebra classes. The author also reported negative effects for students in the Algebra 1, Algebra 1 Honors, and MJ-3 Advanced courses. But the WWC concluded that these negative effects were neither statistically significant nor large enough to be considered substantively important by WWC criteria. Thus, *I CAN Learn*® showed a statistically significant positive effect for MJ-3 pre-algebra students and indeterminate effects for Algebra 1, Algebra 1 Honors, and MJ-3 Advanced students.[4]

Kirby (2004, September) reported that the *I CAN Learn*® group statistically significantly outperformed the comparison group on the General Mathematics exam from the California Standards Test. The statistical significance of this effect was confirmed by WWC analysis.

Kirby (2004a, November) reported that the *I CAN Learn*® group statistically significantly outperformed the comparison group on the Math exam from the Georgia Criterion-Referenced Competency Test. The statistical significance of this effect was confirmed by WWC analysis.

Kirby (2005, January) reported that a higher percentage of *I CAN Learn*® students than comparison students passed the Algebra 1 End-of-Course Test in Georgia. The statistical significance of this effect was confirmed by WWC analysis.

In sum, in the math achievement domain, the WWC reviewed findings from 12 samples reported in six studies.[5] Five of these samples showed statistically significant positive effects, and the remaining seven samples showed indeterminate effects. One of the samples was examined in a study that used a strong design.

Rating of effectiveness

The WWC rates the effects of an intervention in a given outcome domain as positive, potentially positive, mixed, no discernible effects, potentially negative, or negative. The rating of effectiveness takes into account four factors: the quality of the research design, the statistical significance of the findings,[6] the size of the difference between participants in the intervention and comparison conditions, and the consistency in findings across studies (see the WWC Intervention Rating Scheme).

4. Findings for subgroups, such as MJ-3 pre-algebra students who were not Florida Comprehensive Assessment Test (FCAT) exempt and MJ-3 pre-algebra students exempt from the FCAT, are reported in Appendix A4, but are not included in the WWC rating of effectiveness for the intervention.
5. The four courses in the Kerstyn (2001; 2002 October) studies—Algebra 1, Algebra 1 Honors, MJ-3 pre-algebra, and MJ-3 Advanced—were treated as separate studies because they examined effects of *I CAN Learn*® on different samples of students using different curricula.

The WWC found *I CAN Learn*® *Pre-Algebra* and *Algebra* to have positive effects on math achievement

Improvement index

The WWC computes an improvement index for each individual finding. In addition, within each outcome domain, the WWC computes an average improvement index for each study and an average improvement index across studies (see Technical Details of WWC-Conducted Computations). This improvement index represents the difference between the percentile rank of the average student in the intervention condition versus the percentile rank of the average student in the comparison condition. Unlike the rating of effectiveness, the improvement index is entirely based on the size of the effect, regardless of the statistical significance of the effect, the study design, or the analyses. The improvement index can take on values between –50 and +50, with positive numbers denoting results favorable to the intervention group.

The average improvement index for math achievement is +6 percentile points across the six studies, with a range of –7 to +20 percentile points across findings.

Summary

The WWC reviewed 12 research reports on the *I CAN Learn*® *Pre-Algebra* and *Algebra* curricula for this updated curriculum report. Of these, one study met WWC standards and five studies (which reported on 11 student samples or sub-studies) met WWC standards with reservations. The remaining six studies did not meet WWC evidence screens. Based on the findings reported in these studies, the WWC concluded that the *I CAN Learn*® system has a positive effect on math achievement. The evidence presented in this report may change as new research emerges.

References

Met WWC evidence standards

Kirby, P. C. (2006, October). *I CAN Learn® in Orleans Parish Public Schools effects on LEAP 8th grade math achievement, 2003–2004.* (Available from ed-cet, Inc., 2301 Killdeer Street, New Orleans, LA 70122)

Additional source:

Kirby, P. C. (2004b, November). *I CAN Learn® in Orleans Parish Public Schools effects on LEAP 8th grade math achievement, 2003–2004.* (Available from ed-cet, Inc., 2301 Killdeer Street, New Orleans, LA 70122)

Met WWC evidence standards with reservations

Kerstyn, C. (2001). *Evaluation of the I CAN Learn® mathematics classroom: First year of implementation (2000–2001 school year).* (Available from the Division of Instruction, Hillsborough County Public Schools, 901 East Kennedy Blvd., Tampa, FL 33602)

Kerstyn, C. (2002, October). *Evaluation of the I CAN Learn® mathematics classroom: Second year of implementation (2001–2002 school year).* (Available from the Division of Instruction, Hillsborough County Public Schools, 901 East Kennedy Blvd., Tampa, FL 33602)

Kirby, P. C. (2004, September). *Comparison of I CAN Learn® and traditionally-taught 8th grade general math student performance on the California Standards Test, Spring 2004.* (Available from ed-cet, Inc., 2301 Killdeer Street, New Orleans, LA 70122)

Kirby, P. C. (2004a, November). *Comparison of I CAN Learn® and traditionally-taught 8th grade student performance on the Georgia Criterion-Referenced Competency Test.* Unpublished manuscript.

Kirby, P. C. (2005, January). *I CAN Learn® Algebra I in Catoosa County, Georgia.* (Available from ed-cet, Inc., 2301 Killdeer Street, New Orleans, LA 70122)

6. The level of statistical significance was reported by the study authors or, where necessary, calculated by the WWC to correct for clustering within classrooms or schools and for multiple comparisons. For an explanation, see the WWC Tutorial on Mismatch. See Technical Details of WWC-Conducted Computations for the formulas the WWC used to calculate the statistical significance. In the case of *I CAN Learn® Pre-Algebra and Algebra,* corrections for clustering were needed.

References *(continued)*

Did not meet WWC evidence screens

Brooks, C. (1999, August). *Evaluation of Jefferson Parish technology grant: I Can Learn® Algebra I.* Unpublished report submitted to the Superintendent of Jefferson Parish Public Schools.[7]

Brooks, C. (2000, September). *Evaluation of Jefferson Parish technology grant: I CAN Learn® Algebra I.* (Available from the Department of Educational Leadership, University of New Orleans, New Orleans, LA 70148)[8]

Gill, J. C., & Gifford, C. S. (2001). *Evaluation of Jefferson Parish technology grant: I CAN Learn® Algebra I.* Unpublished manuscript, University of New Orleans, LA.[9]

Oescher, J. (2002, January). *I CAN Learn® education success in California.* (Available from JRL Enterprises, Inc., 3520 General DeGaulle Drive, Suite 1100, New Orleans, LA 70114)[9]

Oescher, J., & Kirby, P. C. (2004, December). *I CAN Learn® results in Dallas, Texas: 9th grade 2003–2004.* (Available from JRL Enterprises, Inc., 3520 General DeGaulle Drive, Suite 1100, New Orleans, LA 70114)[9]

Scafide, K. (2004, November). *Effects of I CAN Learn® on math achievement in Gwinnett County Middle School.* (Available from JRL Enterprises, Inc., 3520 General DeGaulle Drive, Suite 1100, New Orleans, LA 70114)[9]

For more information about specific studies and WWC calculations, please see the WWC *I CAN Learn®* *Pre-Algebra* and *Algebra* Technical Appendices.

7. Complete data were not reported: the WWC could not compute effect sizes.
8. Lack of evidence for baseline equivalence: the study, which used a quasi-experimental design, did not establish that the comparison group was equivalent to the intervention group at baseline.
9. Does not use a strong causal design: there was only one teacher in each study condition for this quasi-experiment, so the analysis could not separate the effects of the intervention from the effects of the teacher.

Appendix

Appendix A1.1 Study characteristics: Kirby, 2006, October (randomized controlled trial)

Characteristic	Description
Study citation	Kirby, P. C. (2006, October). I CAN Learn® in Orleans Parish Public Schools effects on LEAP 8th grade math achievement, 2003–2004. (Available from ed-cet, Inc. 2301 Killdeer Street, New Orleans, LA 70122.) *Additional source:* Kirby, P. C. (2004b, November). I CAN Learn® in Orleans Parish Public Schools effects on LEAP 8th grade math achievement, 2003–2004. (Available from ed-cet, Inc., 2301 Killdeer Street, New Orleans, LA 70122.)
Participants	Participants were 2,400 eighth-grade students (1,082 *I CAN Learn®* students and 1,318 traditional mathematics students) from 57 math classes in 13 Orleans Parish Public Schools.[1] Students were randomly assigned to intervention and comparison classrooms using the SASI Basic Scheduling software. Teachers were not randomized to conditions. Only students with no special education classification were included in the analyses. About 96% of the students in the sample were African-American, less than 1% were Hispanic, and less than 0.5% were Caucasian.[2]
Setting	The study took place in the Orleans Parish public school system, which includes the city of New Orleans. The participating schools were selected for this study based on two criteria: the schools included both traditional and *I CAN Learn®* eighth-grade classes and those classes included at least 20 students each.
Intervention	Students were taught using the *I CAN Learn®* mathematics curriculum. The amount of time students used the *I CAN Learn®* system varied by school, with some students using only the test prep module and others completing up to 95 lessons. The average number of lessons completed was 12.1.
Comparison	Comparison students were taught in traditional classes with the teacher serving as the primary deliverer of instruction. The author does not provide further information on the curriculum.
Primary outcomes and measurement	The primary outcome measure was the Louisiana Educational Assessment Program (LEAP) Grade 8 Mathematics Exam. (See Appendix A2 for more detailed descriptions of outcome measures.)
Teacher training	Information on teacher training was not provided.

1. The original sample included 14 schools. However, random assignment occurred in only 13 schools. For the purposes of this review, the study design and findings are reported for the subsample of 13 schools. Further, the study author conducted analyses of subsamples of students in addition to the total sample of 2,400 students in 13 schools. Those analyses focused on students of teachers who taught both conditions and students with matched pretest and posttest scores. For rating purposes, only the analysis of the total sample in the 13 schools was reviewed because, under the current WWC guidance, there is no attrition or confounding problem that might warrant a review of a subsample. In addition, the two additional analyses did not meet WWC evidence screens because of insufficient information on sample size and pretest equivalence.
2. The study notes that these data were collected in the Orleans Parish Public Schools before Hurricane Katrina. The demographics in the school district have changed since the study was conducted.

Appendix A1.2 Study characteristics: Kerstyn, 2001 (quasi-experimental design)

Characteristic	Description
Study citation	Kerstyn, C. (2001). Evaluation of the I CAN Learn® mathematics classroom: First year of implementation (2000–2001 school year). (Available from the Division of Instruction, Hillsborough County Public Schools, 901 East Kennedy Blvd., Tampa, FL 33602.)
Participants	Participants were 2,539 eighth-grade students in 116 classrooms (58 *I CAN Learn*® classrooms with 1,225 students and 58 traditional classrooms with 1,314 students) in Title I middle schools. The study was limited to regular education students. The students were racially diverse and many were eligible for free or reduced-price lunches. The 58 *I CAN Learn*® classrooms and 58 traditional classrooms were used in the analysis.
Setting	The participating students were from middle schools in the Hillsborough County Public School system in Florida. This county includes the Tampa metro area.
Intervention	Students were taught using the *I CAN Learn*® mathematics curriculum. The author does not indicate how many of the lessons are required to be completed for the curriculum to be implemented as intended. The author indicates that the *I CAN Learn*® system was implemented in 45-, 50-, 80-, and 90-minute class periods. When surveyed, the teachers reported that 45 minutes was not long enough to make it through the curriculum. The intervention and evaluation occurred during the 2000–01 academic year.
Comparison	Students in classrooms that were selected as a match with intervention classrooms were taught in traditional classes using a traditional math curriculum. The author does not provide further information on the curriculum.
Primary outcomes and measurement	The primary outcome measure was the Florida Comprehensive Assessment Test (FCAT) Grade 8 Math Test.[1] (See Appendix A2 for more detailed descriptions of outcome measures.)
Teacher training	Teachers in this study participated in training sessions on the use of the software and hardware, but not on use of the software in instruction.

1. A Semester 1 exam was also administered to study participants at the end of the first semester. The results are not reported in Appendix A3 with the results of the FCAT, because the psychometric properties of the Semester 1 exam were not reported and it measured the effect of the intervention at an earlier point than did the FCAT. Because the FCAT measured math achievement at the end of the school year, the WWC reasoned that the FCAT was a more appropriate and valid measure of the intervention's end-of-year effects.

Appendix A1.3 Study characteristics: Kerstyn, 2002, October (quasi-experimental design)

Characteristic	Description
Study citation	Kerstyn, C. (2002, October). Evaluation of the I CAN Learn® mathematics classroom: Second year of implementation (2001–2002 school year). (Available from the Division of Instruction, Hillsborough County Public Schools, 901 East Kennedy Blvd., Tampa, FL 33602.)
Participants	Participants were 11,125 eighth-grade students in 597 classes (129 *I CAN Learn*® classes with 1,871 students and 468 traditional mathematics classes with 9,254 students) enrolled in Algebra I, Algebra I Honors, MJ-3 pre-algebra, or MJ-3 Advanced math classes in the 41 middle schools in Hillsborough County Schools, Florida. The analyses incorporate all students. Subgroup analyses present separate results for standard curriculum students and FCAT-exempt students. Compared with traditional classrooms, a higher proportion of *I CAN Learn*® students were on free and reduced-price lunch and were from minority backgrounds (African-American and Hispanic).
Setting	Participating students were from middle schools in the Hillsborough County Public School system in Florida. This county includes the Tampa metro area.
Intervention	Students were taught using the *I CAN Learn*® *Algebra* course, which consists of 109 complete algebra lessons. The *I CAN Learn*® system is intended to be the primary source of instruction. The intervention and evaluation occurred during the 2001–02 academic year.
Comparison	Comparison students were taught using a traditional math curriculum. The author does not provide further information on the curriculum.
Primary outcomes and measurement	The primary outcome measure was the FCAT Grade 8 Math Test. (See Appendix A2 for more detailed descriptions of outcome measures.)
Teacher training	Information on teacher training was not provided.

Appendix A1.4 Study characteristics: Kirby, 2004, September (randomized controlled trial with teacher-intervention confound problem)

Characteristic	Description
Study citation	Kirby, P. C. (2004, September). Comparison of I CAN Learn® and traditionally-taught 8th grade general math student performance on the California Standards Test, Spring 2004. (Available from ed-cet, Inc., 2301 Killdeer Street, New Orleans, LA 70122.)
Participants	Participants were 204 eighth-grade students (91 *I CAN Learn®* students and 113 traditional mathematics students) in Bret Harte Middle School. The *I CAN Learn®* classrooms contained a higher proportion of African-American students and a lower proportion of Hispanic and non-native English speaking students than the comparison classrooms.
Setting	The participating students were from Bret Harte Middle School, which is one of five middle schools in Hayward Unified School District in Alameda County, California. Hayward, southeast of San Francisco and south of Oakland, had a population of 144,633 and a mean household income of $51,177, according to the 2000 Census. The city is ethnically diverse, with Hispanics (34%), whites (29%), Asians (21%), and African-Americans (11%).
Intervention	Students were taught eighth-grade mathematics by one teacher using the *I CAN Learn®* mathematics curriculum. The *I CAN Learn®* system consists of 303 lessons from basic mathematics to advanced algebra concepts. Teachers choose the lessons that align to local curricular goals. The *I CAN Learn®* system is intended to be the primary source of instruction. The intervention and evaluation occurred during the 2003–04 academic year.
Comparison	Comparison students were taught in traditional classes, with the teacher as the primary deliverer of instruction, using a curriculum based on the state-adopted Glencoe pre-algebra textbook.
Primary outcomes and measurement	The primary outcome measure was the General Mathematics exam from the California Standards Test (CST). (See Appendix A2 for more detailed descriptions of outcome measures.)
Teacher training	Information on teacher training was not provided.

Appendix A1.5 Study characteristics: Kirby, 2004a, November (randomized controlled trial with teacher-intervention confound problem)

Characteristic	Description
Study citation	Kirby, P. C. (2004a, November). Comparison of I CAN Learn® and traditionally-taught 8th grade student performance on the Georgia Criterion-Referenced Competency Test. Unpublished manuscript.
Participants	Participants were 254 eighth-grade students (93 in *I CAN Learn®* classes and 161 in traditional classes). All participants were regular education students.
Setting	One middle school in the Gilmer County School District in northwestern Georgia.
Intervention	Students were taught by one teacher using the *I CAN Learn®* system. The intervention was implemented during the 2003-04 school year.
Comparison	Comparison students were taught in traditional classes, with the teacher serving as the primary deliverer of instruction. The author did not specify what curriculum was used.
Primary outcomes and measurement	The primary outcome measure was the math exam from the Georgia Criterion-Referenced Competency Test (GCRCT). (See Appendix A2 for more detailed descriptions of outcome measures.)
Teacher training	Only one *I CAN Learn®* teacher in this study was trained in the year prior to implementation.

Appendix A1.6 Study characteristics: Kirby, 2005, January (randomized controlled trial with teacher-intervention confound problem)

Characteristic	Description
Study citation	Kirby, P. C. (2005, January). I CAN Learn® Algebra I in Catoosa County, Georgia. (Available from ed-cet, Inc., 2301 Killdeer Street, New Orleans, LA 70122.)
Participants	Participants were 137 ninth-grade students (84 *I CAN Learn*® students and 53 traditional mathematics students) enrolled in Algebra I during the 2004 winter semester.
Setting	The participating students were from suburban high schools (Lakeview-Fort Ogelthorpe High School in Catoosa County, Georgia, and in the metropolitan area of Chattanooga, Tennessee). The student population is 95% white; 27% of the students were eligible for free or reduced-price school lunches.
Intervention	Students were taught Algebra I by one teacher using the *I Can Learn*® *Algebra* curriculum. The *I CAN Learn*® *Algebra* course consists of 177 lessons and a 23,550-question question bank in 17 units. The *I CAN Learn*® system is intended to be the primary source of instruction.
Comparison	Comparison students were taught in traditional classes, with the teacher serving as the primary deliverer of instruction. Their curriculum was based on the Georgia Quality Core Curriculum standards, using the Larson, Boswell, Kanold, and Stiff (2001) *Algebra I* textbook published by McDougal Littell.
Primary outcomes and measurement	The primary outcome measure was the Georgia Algebra 1 End-of-Course Test (EOCT).
Teacher training	*I CAN Learn*® classes were taught by a teacher trained in a two-day summer workshop on how to use the software and how to manage the instructional environment.

Appendix A2 Outcome measures in the math achievement domain

Outcome measure	Description
Florida Comprehensive Assessment Test (FCAT) Grade 8 Math Test	The FCAT math test is a standardized measure that includes items related to all five content strands of Florida's *Sunshine State Standards* for mathematics: number sense, concepts, and operations; measurement; geometry and spatial sense; algebraic thinking; and data analysis and probability (as cited in Kerstyn, 2001; Kerstyn, 2002 October). Test content at grade 8 is evenly divided among these five content strands. Students are given 160 minutes to take the exam, which includes multiple-choice items, gridded-response items, and performance tasks. Test results are reported as scale scores, which range from 100 to 500.
General Mathematics exam from the California Standards Test (CST)	The General Mathematics CST for grade 8 is based on the California Mathematics Standards for grades 6 and 7 (as cited in Kirby, 2004 September). The CST is administered to students in grades 8 and 9 who have not yet completed or are not enrolled in discipline-specific standards-based math courses, or who are enrolled in the first year of a multi-year Algebra I course. The CST consists of 65 multiple-choice questions. Test results are reported as scale scores, which range from 150 to 600.
Louisiana Educational Assessment Program (LEAP) Grade 8 Mathematics Exam	The LEAP Mathematics test for grade 8 includes a multiple-choice section and an open-ended section for more complex tasks (as cited in Kirby, 2006 October). The test is aligned to the state's Comprehensive Curriculum and Grade Level Expectations. Six strands of the Louisiana Mathematics Framework are represented in LEAP: number and number relations; algebra; measurement; geometry; data analysis, probability, and discrete math; and patterns, relations, and functions. Test results are reported as scale scores, which range from 100 to 500.
Georgia Algebra 1 End-of-Course Test (EOCT)	The state-mandated Algebra 1 EOCT is aligned with the Georgia Quality Core Curriculum standards (as cited in Kirby, 2005 January). As of Fall 2004, the EOCT score is factored into students' Algebra I course grade. The Algebra 1 EOCT contains 90 questions related to five content domains: algebraic fundamentals, operations on real numbers and algebraic expressions, solving equations and inequalities, functions and their graphs, and connections and applications. Students pass the EOCT by scoring 600 or above, and the figures reported are based on the dichotomous pass/fail measure. The study presents the proportion of students passing the test.
Georgia Criterion-Referenced Competency Test (GCRCT) Math Test	The GCRCT is designed to measure how well students acquire the skills and knowledge described in the Georgia Performance Standards and the Quality Core Curriculum (as cited in Kirby, 2004a November). The GCRCT Math Test contains 60 items in six areas: number sense and numeration; geometry and measurement; patterns, relationships, and algebra; statistics and probability; computation and estimation; and problem solving. Test results are reported as scale scores, which range from 150 to 450.

Appendix A3 Summary of study findings included in the rating for the math achievement domain[1]

Outcome measure	Study sample	Sample size (schools/ students)	Author's findings from the study: Mean outcome (standard deviation[2]) — *I CAN Learn®* group	Author's findings from the study: Mean outcome (standard deviation[2]) — Comparison group	WWC calculations: Mean difference[3] (*I CAN Learn®* – comparison)	WWC calculations: Effect size[4]	WWC calculations: Statistical significance[5] (at $\alpha = 0.05$)	WWC calculations: Improvement index[6]
Kirby, 2006, October (randomized controlled trial)[7]								
LEAP Math scale scores	Grade 8	13/2,400	295.30 (37.60)	278.82 (43.50)	16.48	0.35	Statistically significant	+14
Average[8] for math achievement (Kirby, 2006 October)						0.35	Statistically significant	+14
Kerstyn, 2001, Algebra 1 (quasi-experimental design)[7]								
FCAT mathematics	Grade 8	16/350	351.38 (30.80)	344.60 (28.36)	6.92	0.23	ns	+9
Average[8] for math achievement (Kerstyn, 2001 Algebra 1)						0.23	ns	+9
Kerstyn, 2001, Algebra 1 Honors (quasi-experimental design)[7]								
FCAT mathematics	Grade 8	16/336	372.99 (34.47)	373.73 (35.80)	–0.74	–0.02	ns	–1
Average[8] for math achievement (Kerstyn, 2001 Algebra 1 Honors)						–0.02	ns	–1
Kerstyn, 2001, MJ-3 pre-algebra (quasi-experimental design)[7]								
FCAT mathematics	Grade 8	64/1,420	296.77 (31.19)	293.89 (38.09)	2.88	0.08	ns	+3
Average[8] for math achievement (Kerstyn, 2001 MJ-3 pre-algebra)						0.08	ns	+3
Kerstyn, 2001, MJ-3 Advanced (quasi-experimental design)[7]								
FCAT mathematics	Grade 8	20/430	332.51 (31.19)	327.40 (29.60)	5.11	0.17	ns	+7
Average[8] for math achievement (Kerstyn, 2001 MJ-3 Advanced)						0.17	ns	+7
Kerstyn, 2002, October, Algebra 1 (quasi-experimental design)[7]								
FCAT mathematics	Grade 8	66/1,195	347.40 (20.90)	349.80 (21.00)	–2.36	–0.11	ns	–5
Average[8] for math achievement (Kerstyn, 2002 October, Algebra 1)						–0.11	ns	–5

(continued)

Appendix A3 Summary of study findings included in the rating for the math achievement domain *(continued)*

Outcome measure	Study sample	Sample size (schools/ students)	Author's findings from the study: Mean outcome (standard deviation[2]) — *I CAN Learn®* group	Author's findings from the study: Mean outcome (standard deviation[2]) — Comparison group	WWC calculations: Mean difference[3] (*I CAN Learn®* – comparison)	WWC calculations: Effect size[4]	WWC calculations: Statistical significance[5] (at $\alpha = 0.05$)	WWC calculations: Improvement index[6]
Kerstyn, 2002, October, Algebra 1 Honors (quasi-experimental design)[7]								
FCAT mathematics	Grade 8	91/1,894	369.60 (27.80)	374.30 (27.60)	–4.73	–0.17	ns	–7
Average[8] for math achievement (Kerstyn, 2002 October, Algebra 1 Honors)						–0.17	ns	–7
Kerstyn, 2002, October, MJ-3 pre-algebra (quasi-experimental design)[7]								
FCAT mathematics	Grade 8	328/5,957	293.80 (32.00)	289.90 (40.50)	3.91	0.10	Statistically significant	+4
Average[8] for math achievement (Kerstyn, 2002 October, MJ-3 pre-algebra)						0.10	Statistically significant	+4
Kerstyn, 2002, October, MJ-3 Advanced (quasi-experimental design)[7]								
FCAT mathematics	Grade 8	112/2,079	329.90 (23.90)	331.00 (24.10)	–1.11	–0.05	ns	–2
Average[8] for math achievement (Kerstyn, 2002 October, MJ-3 Advanced)						–0.05	ns	–2
Kirby, 2004, September (randomized controlled trial with teacher-intervention confound problem)[7]								
General Mathematics CST	Grade 8	1/204	315.60 (45.80)	299.70 (49.70)	15.85	0.33	Statistically significant	+13
Average[8] for math achievement (Kirby, 2004 September)						0.33	Statistically significant	+13
Kirby, 2004a, November (randomized controlled trial with teacher-intervention confound problem)[7]								
GCRCT[9]	Grade 8	1/254	333.50 (35.70)	319.90 (31.70)	13.60	0.41	Statistically significant	+16
Average[8] for math achievement (Kirby, 2004a November)						0.41	Statistically significant	+16

(continued)

Appendix A3 Summary of study findings included in the rating for the math achievement domain *(continued)*

Outcome measure	Study sample	Sample size (schools/ students)	Author's findings from the study: Mean outcome (standard deviation[2]) — *I CAN Learn®* group	Author's findings from the study: Mean outcome (standard deviation[2]) — Comparison group	WWC calculations: Mean difference[3] (*I CAN Learn®* – comparison)	WWC calculations: Effect size[4]	WWC calculations: Statistical significance[5] (at $\alpha = 0.05$)	WWC calculations: Improvement index[6]
Kirby, 2005, January (randomized controlled trial with teacher-intervention confound problem)[7]								
Algebra 1 EOC test	Grade 9	1/137	0.86 (0.35)	0.72 (0.45)	0.14	0.52	Statistically significant	+20
Average[8] for math achievement (Kirby, 2005 January)						0.52	Statistically significant	+20
Domain average[8] for math achievement across all studies						0.15	na	+6

ns = not statistically significant

na = not applicable

1. This appendix reports findings considered for the effectiveness rating and the average improvement indices. Subgroup findings from the same studies are not included in these ratings but are reported in Appendix A4.
2. The standard deviation across all students in each group shows how dispersed the participants' outcomes are: a smaller standard deviation on a given measure would indicate that participants had more similar outcomes.
3. Positive differences and effect sizes favor the intervention group; negative differences and effect sizes favor the comparison group. The mean difference is adjusted for pretest differences in Kerstyn (2002, October). For each sample reported in Kerstyn (2002, October), the control group mean is the intercept from the HLM model and the intervention group mean is this intercept plus the type of classroom (intervention or comparison) HLM beta coefficient.
4. For an explanation of the effect size calculation, see Technical Details of WWC-Conducted Computations. The effect size for Kirby (2005, January) is estimated based on the Cox Transformation (logs odds ratio divided by 1.65).
5. Statistical significance is the probability that the difference between groups is a result of chance rather than a real difference between the groups.
6. The improvement index represents the difference between the percentile rank of the average student in the intervention condition and that of the average student in the comparison condition. The improvement index can take on values between –50 and +50, with positive numbers denoting results favorable to the intervention group.
7. The level of statistical significance was reported by the study authors or, where necessary, calculated by the WWC to correct for clustering within classrooms or schools and for multiple comparisons. For an explanation about the clustering correction, see the WWC Tutorial on Mismatch. See Technical Details of WWC-Conducted Computations for the formulas the WWC used to calculate statistical significance. In the case of Kerstyn (2001) and Kirby (2006), corrections for clustering were needed. No other studies required corrections for clustering or multiple comparisons.
8. The WWC-computed average effect sizes for each study and for the domain across studies are simple averages rounded to two decimal places. The average improvement indices are calculated from the average effect size.
9. The author reported results from the Georgia Criterion-Referenced Competency Test as scale scores and as criterion scores (that is, the percentage that passed the criterion score compared with the percentage that failed), but the WWC focused on the results from the scale scores because they contain more information than categorical scores.

Appendix A4 Summary of subgroup findings for the math achievement domain[1]

Outcome measure	Study sample	Sample size (schools/ students)	Author's findings from the study: Mean outcome (standard deviation[2]) — *I CAN Learn®* group	Author's findings from the study: Mean outcome (standard deviation[2]) — Comparison group	WWC calculations: Mean difference[3] (*I CAN Learn®* – comparison)	WWC calculations: Effect size[4]	WWC calculations: Statistical significance[5] (at $\alpha = 0.05$)	WWC calculations: Improvement index[6]
Kerstyn, 2002, October, MJ-3 pre-algebra standard curriculum (quasi-experimental design)[7]								
FCAT mathematics	Grade 8	258/4,045	294.20 (33.90)	295.10 (33.50)	–0.90	–0.03	ns	–1
Kerstyn, 2002, October, MJ-3 pre-algebra FCAT-exempt (quasi-experimental design)[7]								
FCAT mathematics	Grade 8	249/888	299.50 (37.60)	284.40 (52.90)	15.15	0.29	Statistically significant	+11

ns = not statistically significant

1. This appendix presents additional subgroup findings for measures that fall in the math achievement domain. The findings used for rating purposes are presented in Appendix A3.
2. The standard deviation across all students in each group shows how dispersed the participants' outcomes are: a smaller standard deviation on a given measure would indicate that participants had more similar outcomes.
3. Positive differences and effect sizes favor the intervention group; negative differences and effect sizes favor the comparison group.
4. For an explanation of the effect size calculation, see Technical Details of WWC-Conducted Computations.
5. Statistical significance is the probability that the difference between groups is a result of chance rather than a real difference between the groups.
6. The improvement index represents the difference between the percentile rank of the average student in the intervention condition and that of the average student in the comparison condition. The improvement index can take on values between –50 and +50, with positive numbers denoting results favorable to the intervention group.
7. The level of statistical significance was reported by the study authors or, where necessary, calculated by the WWC to correct for clustering within classrooms or schools (corrections for multiple comparisons were not done for findings not included in the overall intervention rating). For an explanation about the clustering correction, see the WWC Tutorial on Mismatch. See Technical Details of WWC-Conducted Computations for the formulas the WWC used to calculate statistical significance. In the case of Kerstyn (2002, October), no correction for clustering was needed.

Appendix A5 *I Can Learn*® rating for the math achievement domain

The WWC rates an intervention's effects in a given outcome domain as positive, potentially positive, mixed, no discernible effects, potentially negative, or negative.[1]

For the outcome domain of math achievement, the WWC rated *I CAN Learn*® *Pre-Algebra* and *Algebra* as having positive effects. The remaining ratings (potentially positive effects, mixed effects, no discernible effects, potentially negative effects, and negative effects) were not considered because *I CAN Learn*® was assigned the highest applicable rating.

Rating received
Positive effects: Strong evidence of a positive effect with no overriding contrary evidence.
• Criterion 1: Two or more studies showing statistically significant *positive* effects, at least one of which met WWC evidence standards for a strong design.
Met. Five studies of *I CAN Learn*® showed statistically significant positive effects. Of those, one study had a strong design according to WWC standards.
• Criterion 1: No studies showing statistically significant or substantively important *negative* effects.
Met. Five studies of *I CAN Learn*® showed statistically significant positive effects. The remaining seven studies showed indeterminate effects. No studies showed statistically significant or substantively important negative effects.

1. For rating purposes, the WWC considers the statistical significance of individual outcomes and the domain level effect. The WWC also considers the size of the domain level effect for ratings of potentially positive or potentially negative effects. See the WWC Intervention Rating Scheme for a complete description.